



# Factors Related to Smoking Status Among Young Adults: An Analysis of Younger and Older Young Adults in Korea

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**Objectives:** Young adulthood represents a critical developmental period during which the use of tobacco may begin or cease. Furthermore, differences in smoking behaviors between younger (aged 18-24 years) and older (aged 25-34 years) young adults may exist. This study aimed to characterize patterns related to current smoking in younger and older young adults.

**Methods:** This study used data acquired from the Sixth Korea National Health and Nutrition Examination Survey conducted from 2013 to 2014. A total of 2069 subjects were categorized as younger (712 subjects) and older (1357 subjects) young adults. The chi-square test was used to assess the relationships between smoking status and socio-demographic, health-related, and smoking-related factors. Multivariable logistic regression models were constructed to assess the factors affecting current smoking in these age groups.

**Results:** The current smoking prevalence was 18.3% among the younger young adults and 26.0% among the older young adults. Sex, education level, occupation, perceived health status, alcohol consumption, and electronic cigarette use were related to current smoking in both age groups. Secondhand smoke exposure at home and stress levels showed significant relationships with smoking in younger and older young adults, respectively.

**Conclusions:** Strong correlations were found between the observed variables and smoking behaviors among young adults. Determining the factors affecting smoking and designing interventions based on these factors are essential for smoking cessation in young adults.

**Key words:** Young adult, Smoking, Smoking prevention, Smoking cessation

## INTRODUCTION

Young adulthood represents a critical time of development during which the use of tobacco may begin or cease. Quitting smoking before the age of 35 years can prevent many of the

harmful consequences of smoking, resulting in nearly identical survival rates compared with those who have never smoked [1,2]. Smoking behaviors among young adults are influenced by the significant life transitions that occur during this time [3,4]. Given more autonomy, young adults establish health-related behaviors that can persist until the end of their lives [5]. Moreover, they are susceptible to initiating smoking as one of their new activities. Smoking behavior among young adults is predictive of smoking in later years [6]. Most young adult smokers are intermittent smokers, but become more addicted to smoking, and eventually become established smokers [3]. This is why the tobacco industry not only focuses on targeting young adults to convert them into new smokers, but also encourages intermittent smokers to become regular smokers [5].

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Given the importance of understanding smoking behavior in young adults for tobacco control, many prior studies have focused on the young adult population [7-10]. However, those studies mainly sought to identify factors associated with smoking behaviors only among young adults or to compare characteristics between young adults and other age groups; as such, little is known about differences within the young adult population. More specifically, it has not been established how transitions in smoking behavior occur, which factors increase current smoking, or even if being older is associated with more frequent cigarette use among young adults [11-13]. In Korea, the decision to attain the highest level of tertiary education [14] prolongs the time taken for young adults to complete their education, while the low employment rate among young adults [15] delays their societal beginning of life. Therefore, the transition period between adolescence and adulthood, referred to as young adulthood, is delayed and prolonged. In light of this trend among young adults in Korea, the age limit for the implementation of the Special Act on the Promotion of Youth Employment for young adults was extended to 34 years [16]. Hence, the present study defined young adults as those aged 18-34 years. In line with this definition, Newman and Newman [17] explored how best to categorize the developmental processes of young adulthood. Young adults aged 18-24 years are commonly considered to be in transition, from late adolescence or emerging adulthood to adulthood; this period involves frequent risks and explorations in regard to many aspects of life including family, education, work, and roles. Meanwhile, adults aged 25-34 years are referred to as older young adults because their physical development and maturation are considered complete by this point. Given the importance of understanding how different characteristics are associated with different phases of life, some recent studies [6,7,18,19] have identified differences in smoking behaviors between younger (those aged 18-24 years) and older (those aged 25-34 years) young adults. Younger young adults tend to use flavored tobacco products [18] and multiple tobacco products [6]. They also tend to acquire their cigarettes from their friends or other people with whom they have social relationships [7], and are less likely to utilize smoking cessation websites [19] than with older young adults.

This study is the first to examine the factors affecting current smoking among young adults based on a dichotomization of age groups using a representative national Korean adult sample. This study hypothesized that there would be

strong correlations between several variables (including occupational, health-related, and socio-demographic factors) and smoking behaviors among young adults. The study also aimed to compare the patterns of smoking between younger and older young adults.

## METHODS

### Study Population

This study examined data from the Sixth Korea National Health and Nutrition Examination Survey (KNHANES VI) conducted from 2013 to 2014. This nationwide survey was conducted to obtain comprehensive information on the nutritional status, health behavior, health status, and socio-demographic factors of a representative Korean population. The KNHANES utilized a complex, stratified, multistage, and probability-cluster sampling design to select household units.

Of the 15 568 total respondents to the KNHANES VI, 12 920 who were younger than 18 years or older than 34 years were excluded from the current research. Therefore, the remaining 2648 respondents aged between 18 years and 34 years were evaluated. Among these, 396 individuals without data on their smoking status were excluded, as well as 183 additional respondents who lacked data on socio-demographic, health-related, and smoking-related factors. In the final analysis, a total of 2069 subjects were categorized as younger (721 subjects) and older (1348 subjects) young adults. This study received Institutional Review Board approval (No. MC-16EISI0114).

### Study Variables

#### Smoking status

Current smoking status was applied to respondents who reported having smoked at least 100 cigarettes over the course of their lifetime and that they smoked every day or on some days. The non-smoking category included those who never smoked, as well as ex-smokers, those who smoked less than 100 cigarettes [20].

#### Socio-demographic factors

The regions of the survey respondents were classified as urban (Seoul, Gyeonggi, Busan, Daegu, Incheon, Gwangju, Daejeon, and Ulsan) or rural (Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam, and Jeju). Subjects were categorized by education level as those with a college-level education (those who had graduated from, or were

currently enrolled in a 2-year or 4-year college or university), and those with a non-college-level education (those who had never been enrolled in a 2-year or 4-year college or university). There were 3 occupation categories: manual (fishery/agricultural workers, service/sales workers, machine operators, as well as craft and related workers), non-manual (general managers, professional workers, office workers, and government administrators), and other workers (housewives, students, and those who were not in the labor force).

### Health-related factors

Perceived health status was determined based on the respondents' self-reported overall health on a scale of 5 (very good, good, moderate, bad, and very bad). These responses were

condensed into 3 categories: good (very good and good), moderate, and bad (bad and very bad). Stress levels were grouped as severe (very high and high) and mild (low and very low). Alcohol consumption was dichotomized based on whether respondents reported drinking more than once a month over the course of the year leading up to the survey. Regular walking was defined as walking more than 30 minutes at a time and more than 5 d/wk. Obesity was assessed by participants' body mass index (BMI), and participants were categorized as underweight (BMI < 18.5 kg/m<sup>2</sup>), normal weight (18.5-25.0 kg/m<sup>2</sup>), or overweight (BMI > 25.0 kg/m<sup>2</sup>). The presence of depression was defined based on having been diagnosed with depression by a physician.

**Table 1.** General characteristics of participants by age category (younger and older young adults)

Characteristics	Classification	All subjects (n=2069)	Younger young adults (n=721)	Older young adults (n=1348)	p-value
Sex	Male	884 (42.7)	314 (43.6)	570 (42.3)	0.497
	Female	1185 (57.3)	407 (56.4)	778 (57.7)	
Region	Rural	491 (23.7)	172 (23.9)	319 (23.7)	0.176
	Urban	1578 (76.3)	549 (76.1)	1029 (76.3)	
College status	College-educated	1652 (79.8)	608 (84.3)	1044 (77.4)	0.003
	Non-college-educated	417 (20.2)	113 (15.7)	304 (22.6)	
Occupation	Non-manual	736 (35.6)	140 (19.4)	596 (44.2)	<0.001
	Manual	531 (25.7)	196 (27.2)	335 (24.9)	
	Other worker	802 (38.7)	385 (53.4)	417 (30.9)	
Perceived health status	Good	825 (39.9)	337 (46.7)	488 (36.2)	<0.001
	Moderate	1027 (49.6)	312 (43.3)	715 (53.0)	
	Bad	217 (10.5)	72 (10.0)	145 (10.8)	
Stress levels	Severe	636 (30.7)	201 (27.9)	435 (32.3)	0.023
	Mild	1433 (69.3)	520 (72.1)	913 (67.7)	
Alcohol consumption	Yes	1410 (68.1)	494 (68.5)	916 (68.0)	0.344
	No	659 (31.9)	227 (31.5)	432 (32.0)	
Regular walking	Yes	920 (44.5)	395 (54.8)	525 (38.9)	<0.001
	No	1149 (55.5)	326 (45.2)	823 (61.1)	
Obesity	Underweight	214 (10.3)	109 (15.1)	105 (7.8)	<0.001
	Normal weight	1334 (64.5)	472 (65.5)	862 (63.9)	
	Overweight	521 (25.2)	140 (19.4)	381 (28.3)	
Having depression	Yes	60 (2.9)	20 (2.8)	40 (3.0)	0.182
	No	2009 (97.1)	701 (97.2)	1308 (97.0)	
Exposure to secondhand smoke at home	Yes	285 (13.8)	124 (17.2)	161 (11.9)	0.012
	No	1784 (86.2)	597 (82.8)	1187 (88.1)	
Electronic cigarette use	Yes	190 (9.2)	59 (8.2)	131 (9.7)	0.140
	No	1879 (90.8)	662 (91.8)	1217 (90.3)	
Smoking status	Current smoking	483 (23.3)	132 (18.3)	351 (26.0)	<0.001
	Non-smoking	1586 (76.7)	589 (81.7)	997 (74.0)	

Values are presented as number (%).

### Smoking-related factors

Respondents were considered to be exposed to secondhand smoke at home when they reported at-home exposure to secondhand smoke over the 7 days leading up to the survey. Information about the use of electronic cigarettes (e-cigarettes) was solicited to determine whether subjects had ever used an e-cigarette during their lifetime.

### Statistical Analysis

To ensure unbiased national estimates, sampling weights were computed for the participants to ensure that the sample was representative of the Korean population. The chi-square test was used to assess the relationship between smoking status and socio-demographic, health-related, and smoking-re-

lated factors. Multivariable logistic regression models were conducted to assess the factors affecting current smoking in younger and older young adults. Statistical significance in this study was defined as a *p*-value <0.05, and the complex sample design was taken into consideration for the data analysis, which was conducted using SPSS version 24.0 (IBM Corp., Armonk, NY, USA).

## RESULTS

### General Characteristics of the Study Population

A total of 46.7% of younger young adults and 36.2% of older young adults perceived their health status as “good.” Of the younger young adults, 19.4% were overweight, compared to

**Table 2.** Current smoking prevalence of younger and older young adults

Variables	Classification	Younger young adults (n=721)			Older young adults (n=1348)		
		%	$\chi^2$	<i>p</i> -value	%	$\chi^2$	<i>p</i> -value
Sex	Male	32.0	66.560	<0.001	48.0	226.741	<0.001
	Female	7.3			10.4		
Region	Rural	23.2	1.202	0.438	30.6	0.116	0.800
	Urban	19.5			29.6		
College status	College-educated	16.9	31.585	<0.001	25.2	48.323	<0.001
	Non-college-educated	40.0			45.8		
Occupation	Non-manual	6.3	28.950	<0.001	26.3	126.212	<0.001
	Manual	30.7			51.5		
	Other worker	19.7			15.3		
Perceived health status	Good	18.2	16.256	0.003	24.3	28.093	<0.001
	Moderate	18.9			30.3		
	Bad	38.3			47.2		
Stress levels	Severe	21.4	0.104	0.779	36.6	13.811	0.002
	Mild	20.3			26.7		
Alcohol consumption	Yes	24.7	19.081	<0.001	36.5	63.220	<0.001
	No	10.1			15.0		
Regular walking	Yes	24.6	9.210	0.023	29.7	0.013	0.928
	No	15.4			30.0		
Obesity	Underweight	18.3	10.098	0.015	25.6	27.260	<0.001
	Normal weight	18.2			25.6		
	Overweight	30.3			39.8		
Having depression	Yes	27.1	0.492	0.521	54.1	14.873	0.003
	No	20.4			28.9		
Exposure to secondhand smoke at home	Yes	33.2	14.762	0.002	37.0	4.755	0.067
	No	17.9			28.8		
Electronic cigarette use	Yes	72.9	119.429	<0.001	83.8	248.342	<0.001
	No	15.4			22.7		

28.3% of the older young adults. Moreover, 17.2% and 11.9% of the younger and older young adults, respectively, were exposed to secondhand smoke at home. The current smoking prevalence was 18.3% among the younger young adults and 26.0% among the older young adults (Table 1).

### The Prevalence of Current Smoking by Age Group (Younger and Older Young Adults)

Statistically significant differences in smoking prevalence were observed among both younger and older young adults according to sex, education level, occupation, perceived health status, alcohol consumption, obesity, and e-cigarette use.

The current smoking rate of the non-college-educated population was higher than that of the college-educated population among both the younger (40.0% vs. 16.9%) and older (45.8% vs. 25.2%) young adults. The smoking prevalence among

manual workers (30.7%) was almost 5 times higher than among non-manual workers (6.3%). In older young adults, the smoking prevalence among manual workers (51.5%) was 2 times higher than among non-manual workers (26.3%).

Low levels of perceived health status, alcohol consumption, and overweight were associated with a higher prevalence of current smoking in both age groups. Smoking was significantly more prevalent in those with high stress and those with depression.

The current smoking rate was much higher among those who had ever used an e-cigarette during their lifetime than among those who had never used an e-cigarette. This pattern was observed for both younger (72.9% vs. 15.4%) and older (83.8% vs. 22.7%) young adults. Younger young adults who were exposed to secondhand smoke at home (33.2%) displayed much higher current smoking rates than those who were not (17.9%) (Table 2).

**Table 3.** Multivariable logistic regression analysis of factors affecting current smoking by age category

Variables	Classification	Younger young adults	Older young adults
Sex	Female	1.00 (reference)	1.00 (reference)
	Male	4.12 (2.31, 7.35)	9.64 (6.41, 14.50)
Region	Rural	1.00 (reference)	1.00 (reference)
	Urban	0.89 (0.48, 1.66)	1.37 (0.87, 2.17)
College status	College-educated	1.00 (reference)	1.00 (reference)
	Non-college-educated	3.58 (1.85, 6.92)	3.23 (2.00, 5.22)
Occupation	Non-manual	1.00 (reference)	1.00 (reference)
	Manual	4.50 (1.79, 11.31)	2.02 (1.29, 3.16)
	Other worker	3.19 (1.31, 7.78)	0.70 (0.42, 1.15)
Perceived health status	Bad	1.00 (reference)	1.00 (reference)
	Moderate	0.35 (0.17, 0.71)	0.38 (0.20, 0.70)
	Good	0.31 (0.15, 0.62)	0.27 (0.14, 0.54)
Stress levels	Mild	1.00 (reference)	1.00 (reference)
	Severe	1.19 (0.67, 2.10)	1.54 (1.06, 2.22)
Alcohol consumption	No	1.00 (reference)	1.00 (reference)
	Yes	2.39 (1.19, 4.79)	2.38 (1.58, 3.92)
Regular walking	Yes	1.00 (reference)	1.00 (reference)
	No	0.59 (0.32, 1.10)	1.26 (0.86, 1.86)
Obesity	Underweight	1.00 (reference)	1.00 (reference)
	Normal weight	0.57 (0.31, 1.06)	0.96 (0.64, 1.43)
	Overweight	0.66 (0.31, 1.38)	1.17 (0.52, 2.66)
Having depression	No	1.00 (reference)	1.00 (reference)
	Yes	1.20 (0.38, 3.80)	1.80 (0.77, 4.20)
Exposure to secondhand smoke at home	No	1.00 (reference)	1.00 (reference)
	Yes	1.78 (1.01, 3.16)	1.64 (0.99, 2.75)
Electronic cigarette use	No	1.00 (reference)	1.00 (reference)
	Yes	11.63 (5.08, 26.32)	11.49 (5.59, 23.81)

Values are presented as odds ratio (95% confidence interval).

## Factors Affecting Current Smoking Among Young Adults by Age Group

Those who were non-college-educated were 3-4 times more likely to smoke than those who were college-educated among both younger (odds ratio [OR], 3.58; 95% confidence interval [CI], 1.85 to 6.92) and older (OR, 3.23; 95% CI, 2.00 to 5.22) young adults. Manual workers were 4.5 times and 2 times more likely to smoke than non-manual workers among both younger (OR, 4.50; 95% CI, 1.79 to 11.31) and older (OR, 2.02; 95% CI, 1.29 to 3.16) young adults, respectively. Those with good perceived health status were less likely to smoke than those with bad perceived health status among both younger (OR, 0.31; 95% CI, 0.15 to 0.62) and older (OR, 0.27; 95% CI, 0.14 to 0.54) young adults. Alcohol consumption was associated with a 2-3 times higher likelihood of smoking in both younger (OR, 2.39; 95% CI, 1.19 to 4.79) and older (OR, 2.38; 95% CI, 1.58 to 3.92) young adults. Those who had ever used an e-cigarette were 11 times more likely to smoke than those who had never done so among both younger (OR, 11.63; 95% CI, 5.08 to 26.32) and older (OR, 11.49; 95% CI, 5.59 to 23.81) young adults.

Younger young adults who were exposed to secondhand smoke at home were almost twice as likely to smoke than those who were not (OR, 1.78; 95% CI, 1.01 to 3.16). Finally, older young adults with severe stress levels were 1.5 times more likely to smoke than those with mild stress levels (OR, 1.54; 95% CI, 1.06 to 2.22) (Table 3).

## DISCUSSION

The findings of this study suggest a significant gap between younger and older young adults, with the latter being more likely to be current smokers. An almost 10%p difference was found in smoking prevalence between younger (18.3%) and older (26.0%) young adults. Consistent with previous studies, being older adults was associated with a greater likelihood of cigarette use among young adults [11-13].

Further, this study revealed a relationship between socioeconomic status and smoking among the young adult population. Low household income and low levels of education were related to a higher prevalence of current smoking in Korea [21]. In addition, smoking prevalence was higher among manual workers than among non-manual workers [22]. This discrepancy remained consistent according to education level and occupation categories in the current study.

This study demonstrated that both non-college-educated

individuals and manual workers displayed a high prevalence of smoking among younger young adults. Moreover, this pattern remained consistent among older young adults. Non-college-educated young adults were 3-4 times more likely to smoke than those who were college-educated. Young adult smokers with higher levels of education might recognize the importance of tobacco cessation earlier than those with lower levels of education [23]. Low socioeconomic status might influence health inequalities in late adulthood [24]. Hence, future prospective research may help identify causal factors. To more effectively target socially disadvantaged young adults, more information and support must be administered to non-college-educated individuals in this age range to enable them to achieve and maintain better health-related behaviors. Workplaces may prove to be another potential venue for tobacco control efforts to reduce current smoking rates among young adults, in view of the fact that 27.2% of younger young adults and 24.9% of older young adults in this research were manual workers.

Of the health-related factors, perceived health status and alcohol consumption were found to be strongly related to current smoking. Lifestyle factors such as smoking status, drinking habits, food consumption, and physical activity are generally linked to perceived health status [25], and poor perceived health has previously been associated with current smoking [26]. Alcohol consumption was shown to be a major barrier to smoking cessation among young adults [9,10,27,28]. Many young adult smokers tend to be intermittent, light, or social smokers who smoke in social contexts, and this has become an increasingly common pattern among young adults [25]. Alcohol consumption has been found to be related to the occurrence of smoking, especially among infrequent smokers [26,27]. In addition, previous studies have demonstrated that young adult smokers are vulnerable to social situations in which alcohol is consumed in the presence of other smokers and those in which they spend time smoking with other smokers [28]. Summarily, smoking cessation messages that also address health-related issues and promote healthier practices, including moderate to no alcohol consumption among young adults, would enhance perceived health status. Promoting smoke-free environments in places where young adults gather, such as college campuses, restaurants, bars, and clubs is also important in this regard.

In addition, e-cigarettes, which are marketed as a smoking cessation tool in Korea, have been soaring in popularity, with

sales rising as tobacco prices have increased [29]. The results of a nationally representative sample of Korean youth revealed that 9.4% of youth (aged 13-18 years) had smoked an e-cigarette [30], similar to the 10.7% of Korean young adults who reported having tried e-cigarettes in the current study. Such results may suggest that youth and young adults are key targets for the e-cigarette industry. The use of e-cigarettes among less-established smokers, including young adults, has not proven to be an effective means of smoking cessation [31]. Instead, e-cigarette use has been found to be strongly associated with reported current tobacco smoking. Further, e-cigarette use also showed a clear association with the lack of a firm intention not to smoke, which is a powerful predictor of higher risk of progressing to actual use [32]. Moreover, e-cigarette users who held positive beliefs about e-cigarette products were more likely to use e-cigarettes consistently than those who held negative beliefs [33]. Therefore, raising awareness and spreading accurate information regarding e-cigarette use, as well as the regulation of e-cigarettes, should be a high priority for tobacco control among young adults.

A previously published study revealed that respondents in their 20s showed the highest rate of exposure to at-home secondhand smoke in Korea [34]. The present study revealed that 14.4% of young adults were exposed to secondhand smoke at home, and this variable was only associated with current smoking among younger young adults. Younger young adults may share similarities with adolescents, who have been argued to be a vulnerable population to secondhand smoke [35]. However, this study lacks evidence to adequately explain this finding, and few studies have investigated this issue. Therefore, further research is needed to demonstrate why the rate of exposure to at-home secondhand smoke was high among the young adult population. In the current study, stress levels were linked to current smoking among older young adults. As prior research has suggested [36], individuals who began smoking cigarettes at an older age may be more likely than younger initiators to begin smoking in order to manage stress or to decrease depression. Individuals with personal and social stress tend to become addicted to smoking with time [37]. Thus, older young adults might have more lifetime cumulative exposure to social stress, which can affect smoking behavior, than younger young adults. Stress was also found to affect young adults' changes in impulsivity, causing them to require more urgent and immediate coping strategies [38].

Several limitations of this study must be considered in the

interpretation of its findings. First, this was a cross-sectional study. The main finding of this study is that stress was not significantly associated with smoking among younger young adults, but it was significantly associated with smoking among older young adults. However, it was impossible to detect what types of stress might impact older young adults' current smoking. Second, this study could not compare young adult smoking patterns with other age groups' smoking patterns. Distinct smoking patterns of young adults, which are thought to be different from those of other age groups, could not be derived because our study did not analyze smoking patterns among individuals of all ages due to its focus on young adults. Third, the analyses in this study were incapable of distinguishing between younger young adult smokers and older young adult smokers in regard to certain smoking behaviors, such as quitting attempts, due to the small sample size of the relevant sub-groups.

Despite its limitations, this study compared various factors affecting current smoking among younger and older young adults. These findings seem to be consistent with previous studies; however, to our knowledge, this study is the first to examine smoking behavior among young adults in Korea. The findings of this study are significant for future research, which should include a larger sample of subjects to confirm the strong correlations found between smoking among young adults and, in particular, socio-demographic variables. Several such factors were found to be related to young adults' smoking. Even though young adulthood is a critical developmental stage for tobacco use and cessation, current smoking cessation programs are mostly focused on adolescents or middle-aged people. To effectively target the young adult population, the government should strive to implement a more comprehensive approach for encouraging smoking cessation inside young adults' living quarters and support smoking cessation programs to prevent smokers from becoming heavily addicted. Universities or workplaces might be good places to effectively implement smoking cessation programs for young adults. Therefore, smoking behaviors among young adults should receive attention from the public health community.

## CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

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